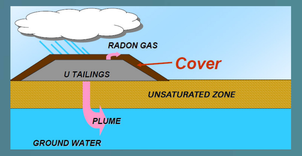
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

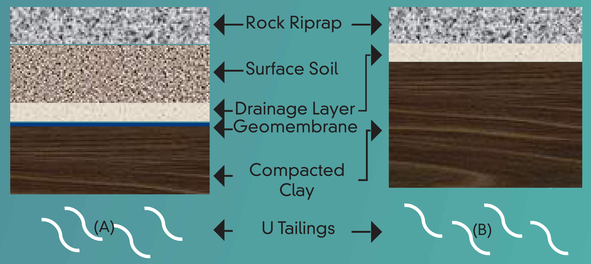
RIC 2011

Long-Term Performance of Engineered Barrier Soil/Composite Covers for Nuclear Waste Isolation



Schematic of Potential Radon and Ground Water Release from a Uranium (U) Tailings Facility

- slow radon flux < 20 pCi m^{-2} s^{-1} (< 0.74 Bq m^{-2} s^{-1})
- control percolation and mobilization of contaminants —satisfy GW standards?
- last for 200-1000 years?



(A) Typical Soil and Composite Cover Materials

(B) Typical Soil Cover Materials

Research Findings on the Performance of Engineered Soil/Composite Covers (NUREG/CR -7028, in print)

1. Soil materials used in covers to isolate radioactive waste do not maintain as-built properties over the period of regulatory interest as assumed in most modeling. Rather, the properties of these materials change to values typical of surrounding soils, thus allowing more water to infiltrate the cover.
2. For some properties, the change may be several orders of magnitude and could have a profound effect on the predicted performance of the cover with respect to regulatory standards for ground water and gaseous releases.
3. The performance of geosynthetic materials in the covers was mixed and in some cases was consistent with service life projections by their manufacturers.
4. Devices to directly monitor cover performance should be large enough to represent field conditions. Indirect monitoring devices, while important, may be off by several orders of magnitude.

Insights from the August 2010 Workshop on Engineered Barrier Performance

1. Update guidance on covers, liners, and construction techniques to incorporate new knowledge and techniques.
2. Establish a common data repository for current and future information on engineered barrier performance.
3. Monitor the waste facility, a) to confirm radon emissions and seepage from the facility and b) to understand processes and identify precursors on water infiltration and gaseous releases.
4. Monitor the unsaturated zone within and below the emplaced wastes and the ecological and plant processes in the cover if critical to cover performance.
5. Modeling should consider conceptual, parameter, and scenario uncertainties that can affect long-term performance.
6. Develop and implement strategies to obtain and evaluate information needed for model support in both short- and long-term modeling assessments.

Engineered Barrier Research in Progress, 2009–2012

"Influence Of Coupling Erosion And Hydrology On The Long-Term Performance Of Barriers," USGS

1. Conduct literature review on erosion control in both humid and arid climates. Select and recommend the most appropriate models for coupling erosion control modeling and hydrology.
2. Compare coupled erosion/hydrology model predictions with field data from instrumented field-scale covers to assess the capabilities of the model(s) to predict cover performance.
3. Evaluate erosion control strategies.